

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.8010/Y.1306

Amendment 2
(07/2010)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA,
DIGITAL SYSTEMS AND NETWORKS

Packet over Transport aspects – Ethernet over Transport
aspects

SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS

Internet protocol aspects – Transport

Architecture of Ethernet layer networks

**Amendment 2: Application of the ITU-T G.800
functional architecture to Ethernet transport and
some editorial revisions**

Recommendation ITU-T G.8010/Y.1306 (2004) –
Amendment 2

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Recommendation ITU-T G.8010/Y.1306

Architecture of Ethernet layer networks

Amendment 2

Application of the ITU-T G.800 functional architecture to Ethernet transport and some editorial revisions

Summary

Amendment 2 to Recommendation ITU-T G.8010/Y.1306 contains additional material to be incorporated into Recommendation ITU-T G.8010/Y.1306, Architecture of Ethernet layer networks. It presents the ITU-T G.800 model of Ethernet layer network architecture.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T G.8010/Y.1306	2004-02-22	15
1.1	ITU-T G.8010/Y.1306 (2004) Amend. 1	2006-05-22	15
1.2	ITU-T G.8010/Y.1306 (2004) Amend. 2	2010-07-29	15

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The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Document ID: 123456789

Recommendation ITU-T G.8010/Y.1306

Architecture of Ethernet layer networks

Amendment 2

Application of the ITU-T G.800 functional architecture to Ethernet transport and some editorial revisions

1 Scope

This amendment provides updated material pertaining to the architecture of Ethernet layer networks, as described in [ITU-T G.8010]. It presents the ITU-T G.800 model of Ethernet layer network architecture including provider bridged network and provider backbone bridged network functional architecture.

This material is new material to be added to the original Recommendation as amended by Amendment 1.

2 References

[ITU-T G.8010] Recommendation ITU-T G.8010/Y.1306 (2004), *Architecture of Ethernet layer networks*, plus Amendment 1 (2006).

3 Conventions

None.

4 Additions and modifications to [ITU-T G.8010]

The following clauses contain additions and modifications to be made to [ITU-T G.8010].

4.1 Clause 2, References

Replace the reference to IEEE 802.1Q with the following:

- IEEE Standard 802.1Q-2005, *IEEE Standard for Local and metropolitan area networks: Virtual Bridged Local Area Networks*.

Add the following references:

- Recommendation ITU-T G.800 (2007), *Unified functional architecture of transport networks*.
- IEEE Standard 802.1ad-2005, *IEEE Standard for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks, Amendment 4: Provider Bridges*.
- IEEE Standard 802.1ah-2008, *IEEE Standard for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks, Amendment 7: Provider Backbone Bridges*.
- IEEE Standard 802.1Qaw-2009, *IEEE Standard for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks, Amendment 9: Management of Data Driven and Data Dependent Connectivity Faults*.



Documents

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- IEEE Standard 802.1aj-2009, *IEEE Standard for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks, Amendment 11: Two-Port Media Access Control (Mac) Relay*.

4.2 Terms to be removed from [ITU-T G.8010]

The following table identifies the target terms and appropriate replacement definition text.

Original Text	Replacement Text
3.3 This Recommendation defines the following terms: 3.3.1 traffic conditioning function: A "transport processing function" which accepts the characteristic information of the layer network at its input, classifies the traffic units according to configured rules, meters each traffic unit within its class to determine its eligibility, polices non-conformant traffic units and presents the remaining traffic units at its output as characteristic information of the layer network. 3.3.2 maintenance entity group: A maintenance entity group is defined, for the purpose of fragment/connection monitoring, between a set of flow/connection points within a fragment/connection. This set of flow/connection points may be located at the boundary of one administrative domain or a protection domain, or at the boundaries of two adjacent administrative domains. The maintenance entity group consists of one or more maintenance entities. 3.3.3 maintenance entity: The entity between two of the flow/connection points in a maintenance entity group. 3.3.4 maintenance entity group end point compound sink function: A compound transport processing function which accepts the characteristic information of the layer network at its input, extracts and processes the OAM information related to the maintenance entity group's monitoring, filters the OAM information from within to the maintenance entity group, adapts the information and presents it as the characteristic information of the layer or a client layer at its output, potentially as a (client) layer maintenance signal (e.g., AIS). 3.3.5 maintenance entity group end point compound source function: A compound transport processing function which accepts the characteristic information of the layer or a client layer network at its input, adapts that information, filters it for OAM information interfering with its own OAM information, adds OAM information to allow the maintenance entity group to be monitored and presents the resulting information at its output.	3.3 This Recommendation uses the following terms defined in Rec. ITU-T G.8001/Y.1354: 3.3.1 traffic conditioning function 3.3.2 maintenance entity group 3.3.3 maintenance entity 3.3.4 maintenance entity group end point compound sink function 3.3.5 maintenance entity group end point compound source function 3.3.6 maintenance entity group intermediate point compound function 3.3.7 proactive monitoring 3.3.8 on-demand monitoring 3.3.9 ETH_CI group 3.3.10 ETH path 3.3.11 ETH tandem connection 3.3.12 ETH section Editor's Note: The "traffic conditioning function" (defined in the original ITU-T G.8010) was redefined as "traffic conditioning and shaping function" in ITU-T G.8010 Amendment 1.

Original Text	Replacement Text
3.3.6 maintenance entity group intermediate point compound function: A compound transport processing function which accepts the characteristic information of the layer network at its input, reacts to OAM information related to the maintenance entity group's on-demand monitoring and presents the characteristic information without the OAM it reacted to at its output. 3.3.7 proactive monitoring: A method to continuously infer the status and performance of a maintenance entity group with the purpose to detect disturbances, faults and degradations immediately after their occurrence in order to verify the service level agreement and/or initiate recovery actions to restore the service to the guaranteed level. 3.3.8 on-demand monitoring: A method to infer a specific status or performance characteristic of a maintenance entity or a set of maintenance entities within a maintenance entity group at a specific point in time with the purpose to obtain a snapshot of the performance, or to diagnose an identified fault condition or performance degradation. 3.3.9 ETH_CI group: A group of ETH_CI signals that is monitored as a single MEG. For this purpose, ETH OAM is added to one of the ETH_CI signals in the group. 3.3.10 ETH path: The highest ETH MEG level in a set of eight MEG levels. 3.3.11 ETH tandem connection: An intermediate ETH MEG level in a set of eight MEG levels. 3.3.12 ETH section: The lowest ETH MEG level in a set of eight MEG levels.	

4.3 Modifications to clauses 6.5.2.2.3 and 6.5.1.3 and Figure V.5

In clauses 6.5.2.2.3 and 6.5.1.3 and in the title of Figure V.5 change the following acronyms:

Change "T-MPLS" to "MPLS-TP"

In clause 6.5.1.3 change "/TM" to "/MT"

In clause 6.5.2.2.3 change "TM/" to "MT/"

In clause 6.5.1.3 change the line

– Type field encapsulation (0x8847 for unicast, per RFC 3032).

to read:

– Type field encapsulation.

4.4 Add new clause 9

Add a new clause 9 as follows:

9 Transport functional architecture of Ethernet networks (using ITU-T G.800)

This clause presents the functional architecture of Ethernet layer networks based on Recommendation ITU-T G.800 – Unified functional architecture of transport networks. This functional architecture covers the Ethernet network structure and behaviour specified in the following standards:

- IEEE 802.1D-2004, *Media Access Control (MAC) Bridges*.
- IEEE 802.1Q-2005, *Virtual Bridged Local Area Networks*.
- IEEE 802.1ad-2005, *Virtual Bridged Local Area Networks, Amendment 4: Provider Bridges*.
- IEEE 802.1ag-2007, *Virtual Bridged Local Area Networks, Amendment 5: Connectivity Fault Management*.
- Recommendation ITU-T Y.1731 (2006), *OAM functions and mechanisms for Ethernet based networks*.
- IEEE 802.1ah-2008, *Virtual Bridged Local Area Networks, Amendment 7: Provider Backbone Bridges*.
- IEEE 802.1Qaw-2009, *Virtual Bridged Local Area Networks, Amendment 9: Management of Data Driven and Data Dependent Connectivity Faults*.
- IEEE 802.1aj-2009, *Virtual Bridged Local Area Networks, Amendment 11: Two-Port Media Access Control (Mac) Relay*.

The functional architecture covers functions within the Ethernet layer network and common aspects of client and server adaptation functions. It does not cover details specific to client or server layer networks or common adaptation functions that are independent of the described Ethernet layer network functions (e.g., there is no discussion of LLC/SNAP or specific PHY functions).

9.1 General principles

Ethernet transport networks provide a connectionless frame (packet) transport service for frames carrying client information. Additional functions are provided for multiplexing, supervision and survivability of the Ethernet transport entities that convey frames in the Ethernet network. The transport functional architecture of Ethernet networks is described using the generic principles defined in Recommendations ITU-T G.805 and G.800 (using conventions as noted in Appendix VIII). The architectural aspects regarding layer network structure, characteristic information, transport entities, transport processing functions, client/server associations, topology and partitioning of Ethernet transport networks are provided in this Recommendation.

9.2 Ethernet transport network layered structure

An Ethernet network layer structure may include any of a large number of media specific layer networks or other server layer networks (e.g., SDH, OTN, etc.) that can provide the MAC service Ethernet expects of its server layers. One of the most important Ethernet server layers is the IEEE 802.3 family of media specific layer networks. Figure 9-1 shows the basic Ethernet layer network structure.

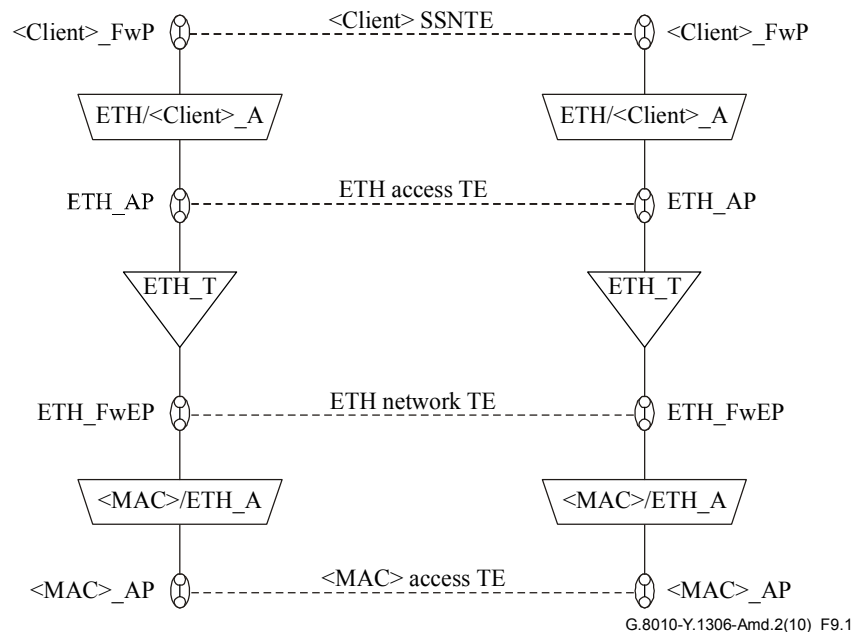


Figure 9-1 – Ethernet layer network structure

Within the media independent layer (ETH) of an Ethernet network, three types of aggregation are supported:

- Aggregation of multiple instances of ETH_CI (MAC frames) into a link connection or server subnetwork transport entity (e.g., LAN). This is shown in Figure 9-2 as "Aggregation of frames to link connection".
NOTE – Sufficient labelling is provided by the MAC destination address (DA) and source address (SA) associated with the frame, so no additional labelling is needed.
- Aggregation of multiple ETH subnetwork transport entities (VLANs) into a monitored aggregate with the addition of a label (VID). Note that one (and only one) of the VLANs may not have a label added. This is shown in Figure 9-2 as "Aggregation of VLANs to link".
- Aggregation of multiple ETH subnetwork transport entities into another ETH subnetwork transport entity (i.e., C-VLANs into an S-VLAN) with the addition of a label (C-VID). This is shown in Figure 9-2 as "Aggregation of C-VLANs to S-VLAN".

Aggregation within an Ethernet layer network may create significant administrative sublayers that can be independently monitored and managed.

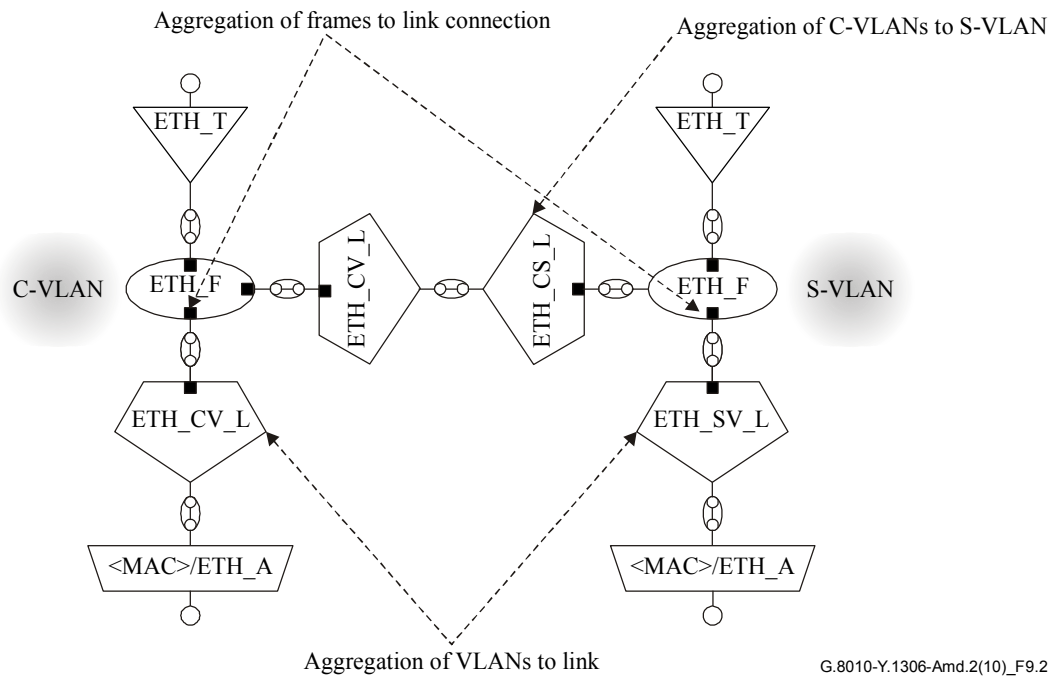


Figure 9-2 – Ethernet aggregation types

A more comprehensive picture of Ethernet layer network structure is shown in Figure 9-3. This figure combines the layering in Figure 9-1 with the aggregation options shown in Figure 9-2 and includes the layering of Ethernet over Ethernet (called provider backbone bridging). The functions shown in Figure 9-3 are described in the clauses below. In addition, Figure 9-3 is used as a reference model for describing the information structure of Ethernet layer networks shown in Table 9-1 below.

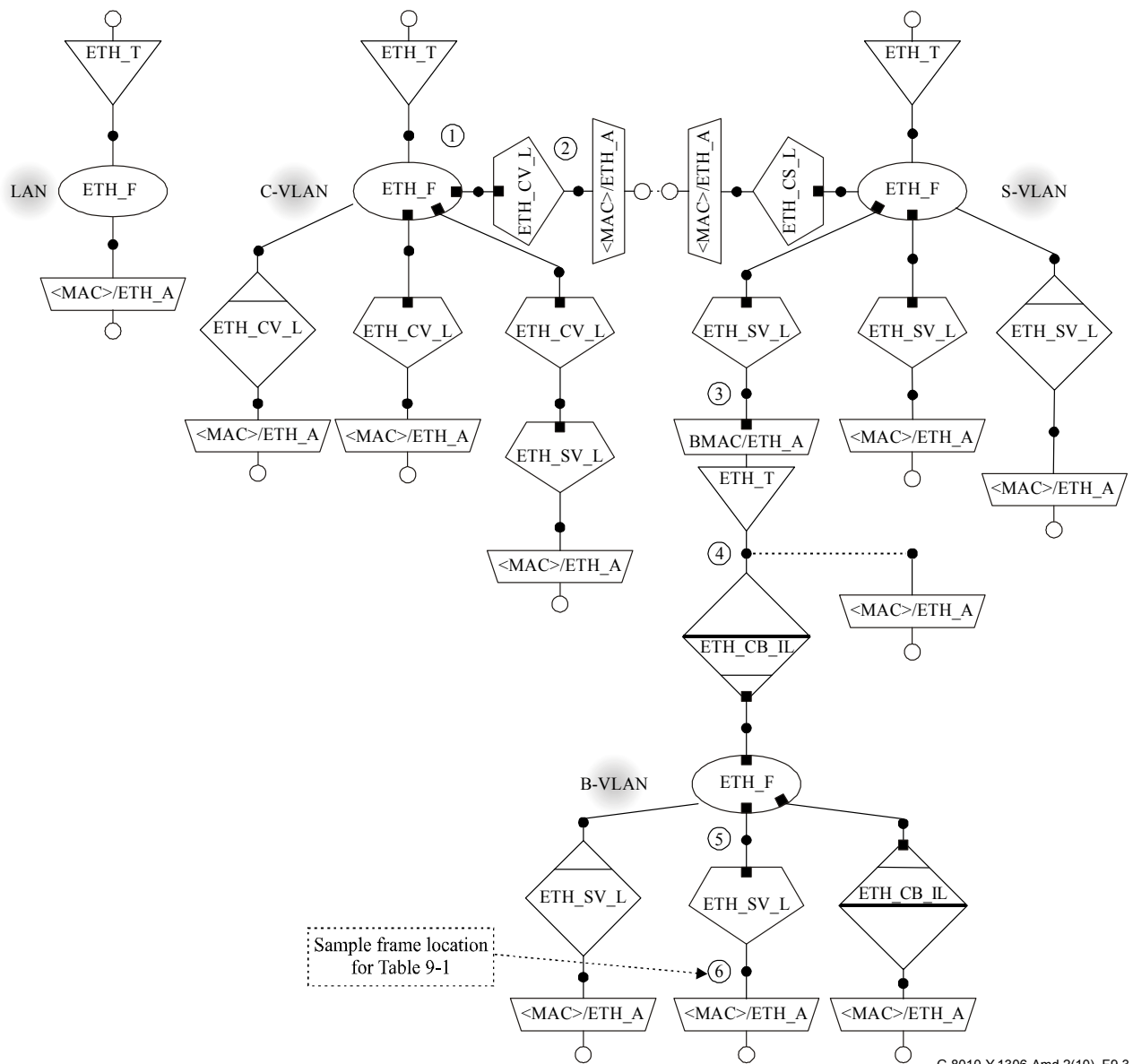


Figure 9-3 – Ethernet layer and aggregation structure

9.3 Ethernet MAC (ETH) layer network

Ethernet networks bridge (provide forwarding between) a variety of media specific and/or limited reach (local area) network technologies. Whether an Ethernet network comprises a single media network or multiple media networks interconnected by bridges is intended to be invisible to the client. For this reason the service interface is called a "media access control" or MAC service interface¹. Therefore a "MAC service access point" (MAC SAP) corresponds to the Ethernet (ETH) layer network access point and the term "MAC termination" may be used to denote the ETH layer network termination function (ETH_T).

¹ Note that the IEEE may in the future revise the definition of the MAC service, and such a revision may impact the description of the MAC service interface as used in this Recommendation.

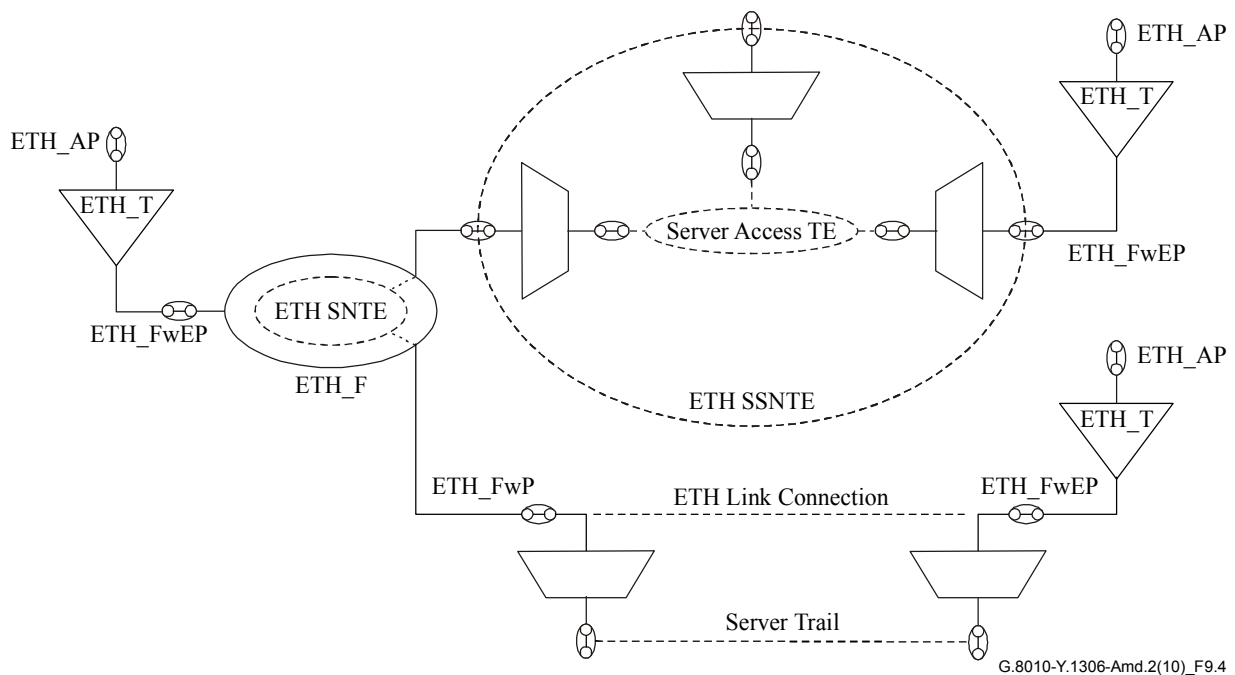


Figure 9-4 – ETH layer network example

The ETH layer network is bounded by ETH access points associated with ETH termination (MAC termination) functions. The ETH forwarding function supports multipoint subnetwork transport entities (ETH SNTEs or VLANs) and the interconnection between ETH forwarding elements may be point-to-point (ETH link connection – ETH_LC) or multipoint (ETH server subnetwork transport entity – ETH SSNTE). An ETH SSNTE must support a broadcast function allowing a single frame to be sent to all ETH forwarding elements (bridges) bound to that SSNTE. An ETH SNTE is bound to an SSNTE or LC at an ETH forwarding point (ETH_FwP). An ETH_T is bound to an ETH SNTE, SSNTE, or LC at a forwarding end point (ETH_FwEP). Figure 9-4 shows an example of a portion of an ETH layer network. Note that the diagram shows bidirectional reference points since Ethernet layer network operation depends on bidirectional connectivity.

9.3.1 ETH information structure

From the viewpoint of any given ETH transport processing function an instance of ETH_CI (an Ethernet MAC frame) comprises the following: [DA][SA][Tag(optional)][MSDU].

This information structure is decomposed into a payload to be carried transparently (the MAC service data unit – MSDU), a number of parameters passed directly between functions which include:

- destination address;
- source address;
- priority;
- discard eligible indication;
- frame check sequence;

and parameters encoded in the MSDU to pass between non-adjacent functions which include:

- tag protocol identifier;
- priority;
- discard eligible indication;
- VLAN identifier;